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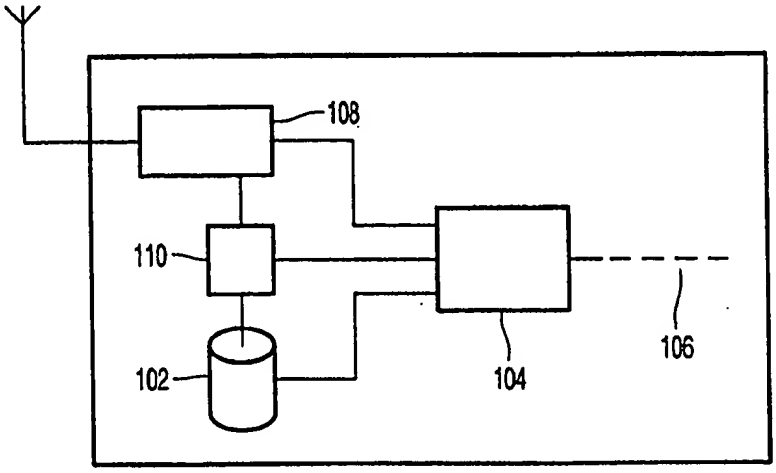

(57) Abstract

The navigation system according to the invention includes a receiver for the reception of a traffic message about one of the road segments in the database of the system. The traffic message includes an event and a location indicating the directly affected road segment. After reception, the system defines a number of road segments as being additionally affected by the traffic event. Subsequently when using road segments from the database, the system treats the directly affected road segment and the additionally affected road segments as being affected by the traffic event, thus taking into account an area of influence around the traffic event.

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TRAFFIC EVENT PROCESSING NAVIGATION SYSTEM

The invention relates to a navigation system for providing navigational information to a driver, the system comprising:

- a database with road segments, a road segment representing a part of a road;
- a receiver for the reception of a traffic message indicating a traffic event and a location to which the traffic event relates, the location corresponding to at least one particular road segment which is affected by the traffic event; and
- processing means coupled to the receiver for processing the traffic message in relation to the affected road segment.

The invention further relates to a method for presenting navigational information to a driver the method comprising the steps of:

- receiving a traffic message indicating a traffic event and a location to which the traffic event relates, the location corresponding to a first road segment which is affected by the traffic event; and
- processing the traffic message in relation to the affected road segment.

Such a navigation system and method are known from United States Patent 5,164,904. In the known system, a traffic message containing traffic congestion data relating to a certain location on the roads is assembled in a central subsystem on the basis of various inputs, e.g. traffic detectors and police reports. The traffic message is broadcast by the central subsystem and received by a receiver in a vehicle subsystem. The vehicle subsystem subsequently presents the traffic message to the driver. The traffic message may be presented as a textual message on a display, as an audible message through speech synthesis of the traffic message, or as a graphical symbol superimposed on a map overlay. In the known system, the area is divided into a number of cells and it is established to what cell a particular message relates. Furthermore, the vehicle subsystem keeps track in which cell the vehicle is travelling and which other cells may be relevant in view of the route followed by the vehicle. The vehicle subsystem may be operated in such a way that only traffic messages relating to a relevant cell are actually presented to the driver. So the known navigational system

filters the traffic messages received in the vehicle. If a traffic message passes the filter, then the event included in the traffic message and the location to which the event relates are presented to the driver of the vehicle. The driver may subsequently decide to choose another route in order to avoid the traffic event on the indicated location.

It is an object of the invention to provide a navigation system of the kind set forth with an improved support for determining a route on the basis of the received traffic message. This object is achieved according to the invention in a navigation system that is characterised in that the system comprises defining means for defining at least one further one of the road segments as additionally affected by the traffic event and that the processing means are arranged for processing the traffic message in relation to the additionally affected road segments. By declaring a further one of the road segments as being affected by the traffic event and by treating this road segment as affected, the navigation system according to the invention gives the traffic message a larger impact on the road segments than just the road segment corresponding to the reported location. The invention is based on the insight that the service of broadcasting traffic messages is limited to major roads and important, large traffic events only and will not include traffic messages related to small roads with minor, less important delays. It appears that in the presence of a traffic event, like a traffic queue on a motor way, the roads in the vicinity of that event are more occupied with traffic than usual, which may result in traffic queues on these roads as well. The inventors have realised that by given the reported traffic event a larger impact than the single reported road, the said limitation of the service of broadcasting traffic messages is mitigated and the actual result of the traffic event is better taken into account. An advantage of the navigation system according to the invention is the improved appreciation of the reported traffic event. A human receiving a traffic message concerning a certain traffic event could conclude that the traffic event also influences the area around the reported location and that a small detour around that location would be pointless, since such detour would include roads which would have problems too. Now the navigation system according to the invention, by taking into account that a traffic message has a larger impact than the single reported location, will in a similar way as the human not suggest a detour in the direct vicinity of the location of the traffic event, which detour would be fraught with problems too.

An embodiment of the navigation system according to the invention is

defined in Claim 2. Defining an explicit region and declaring the road segments in it affected by the reported traffic event, is a simple and effective mechanism for representing the larger influence the traffic event has on its vicinity.

An embodiment of the navigation system according to the invention is defined in Claim 4. By giving the region with additionally affected road segments a size that is dependent on the class of the traffic event, the impact of the traffic event is better reflected. Examples of two event classes are a structural traffic event versus an occasional traffic event, whereby the size of the region for a structural event is made larger than the size of the region for an occasional event. The structural event class includes events like a traffic queue during rush hour and road works and the occasional event class includes an accident and bad weather conditions. A structural event is known to many drivers including those not receiving actual traffic information, causing the usage of escape routes nearby, and/or occurs at times that heavy traffic is expected anyhow. A structural traffic event will therefore influence a larger area than an occasional traffic event.

An embodiment of the navigation system according to the invention is defined in Claim 5. In this embodiment it can be indicated to what extent individual road segments are expected to be influenced by the traffic event. This depends for example on the density of the road network and the topology of the road segment.

An embodiment of the navigation system according to the invention is defined in Claim 6. The distance between the location where the traffic event occurs and the road segment provides an easy and effective estimation for the extent to which such road segments is influenced. A road segment nearby the location of the traffic event is very likely to be more affected than a road segment farther away.

An embodiment of the navigation system according to the invention is defined in Claim 7. Suppressing the processing of road segments which are likely to be affected by the traffic event and which represent road that are less important than the road where the traffic event takes place, is an effective way of dealing with the consequences of the traffic event. It avoids the suggestion of a detour on a minor road in an easy way, by simply excluding the road segment representing such minor road. The remaining road segments are at least as important as the road segment for which the traffic message has been received and if on any one of these roads a traffic event would occur, the broadcasting service will include a traffic message for that event.

An embodiment of the navigation system according to the invention is defined in Claim 8. It is very advantageous to apply the invention in a navigation system including a planning unit, because in that way the influence of the traffic event on the road segments is better taken into account. The planning unit plans a route between an origin and a destination, such route being composed of a number of the road segments in the database and being optimal with respect to a certain criterion, e.g. travel time. For each road segment in the database it is known how much it contributes to the criterion. The planning unit compares a number of alternative routes, i.e. consisting of alternative sets of road segments, between the origin and the destination and chooses that one which satisfies the criterion in the best way. The traffic event makes that the information for the road segments in the database does no longer conform to the actual situation and the planning unit of the navigation system uses the traffic message to correct this. According to the invention, not only the road segment corresponding to the location of the traffic event is considered affected by the traffic event but also the road segments in the vicinity of that location. Then the planning unit plans a route that better takes into account the influence of the traffic event avoiding problems in the direct vicinity of the traffic event.

An embodiment of the navigation system according to the invention is defined in Claim 9. By displaying the traffic event in relation to the additionally affected road segment, the driver may be warned for the existence of an area of influence around the traffic event. This warning is an advice to avoid this area and to not make a detour through this area.

It is a further object of the invention to provide a method of the kind set forth with an improved support for determining a route on the basis of the received traffic message. This object is achieved according to the invention in a method that is characterised in that the method further comprises a step defining at least one second road segment as additionally affected by the traffic event and that the traffic message is processed in relation to the second road segment. By defining a further road segment, in addition to the road segment corresponding to the location of the traffic message, as being affected by the traffic message, the influence of the traffic message is better taken into account. The improved representation of the influence of the traffic event allows for a better choice of a route.

Further advantageous embodiments of the invention are recited in the

dependent claims.

The invention and its attendant advantages will be further elucidated with the aid of exemplary embodiments and the accompanying schematic drawings, whereby:

Figure 1 schematically shows some of the components of a navigation system according to the invention,

Figure 2 shows a region in which the road segments are defined to be affected by the traffic event,

Figure 3 shows an alternative region in which the road segments are defined to be affected by the traffic event,

Figure 4 schematically shows an embodiment of the navigation system including a planning unit,

Figure 5 schematically shows an embodiment of the navigation system including a display unit,

Figure 6 shows an example of a displayed map with a region of influence, and

Figure 7 shows the steps of the method according to the invention.

Corresponding features in the various Figures are denoted by the same reference symbols.

Figure 1 schematically shows some of the components of a navigation system according to the invention. The navigation system 100 has a database with road segments representing the roads of an area of interest to the user of the system. The road segments together are sometimes called an electronic map since they represent the roads in a digitised form. A road segment represents a part of a road and is an elementary item in the database. A road segment has various attributes, holding information on the represented part of the road, e.g. name, location, direction, size, etc. The navigation system 100 also has a processing unit 104 that uses the information in the database with road segments to produce an output 106 that is of use to the user of the system. The nature of the processing and output is not essential to the understanding of the invention and is not further described here. Examples are given in the embodiments that are presented below. The navigation system 100 further has a receiver

108 for the reception of traffic messages. Such a traffic message includes an event, indicating the happening to which the traffic message relates, and a location where the event occurs. An example of a traffic message is a message indicating a traffic queue of a particular length starting from a particular location on a particular road. In an embodiment, the traffic message is broadcast via RDS as described in United States Patent 5,095,532 and its format and contents is conform the standardised Traffic Message Channel (TMC). There the event and location are transferred as codes in the traffic message and the meaning of the codes are agreed upon in the standard. The invention is not restricted to RDS TMC and other ways of transmitting the traffic message may be employed, e.g. via the GSM telephone network. A traffic message may include actual information concerning the roads in the area of interest. A traffic message may also include forecast information, e.g. a weather forecast or expected heavy traffic due to a large happening at a certain place. The processing unit 104 processed the dynamic information of the received traffic message to supplement the static information residing in the database. One or more values of the attributes in the database may no longer be valid in view of the actual information, and the processing unit will then use an updated value instead which is derived from the traffic message.

The processing unit 104 determines to which of the road segment, or exceptionally road segments, the received traffic message relates. A traffic message according to RDS TMC includes a location code, which is an identification of a particular one of a large number of standardised problem locations. In an embodiment, the processing unit consults a cross reference table residing in the database 102 indicating which road segment corresponds to a given location code. In this way it is determined to which road segment a received traffic message relates. This road segment is directly affected by the event of the traffic message. An alternative way of determining this road segment is by establishing which road segment is geographically seen the closest to the location reported in the traffic message. In the case of a traffic message reporting a traffic queue, it is advantageous not to use the reported location of the traffic queue, which location is the begin location of the queue, but to calculate the end location of the queue. This end location can then further be used to determine which of the road segments is directly affected by the event in the traffic message.

The processing unit 104 determines which road segment is directly affected by the traffic event as reported in the traffic message. The navigation system

100 further includes a defining unit 110 that defines one or more road segments of the database as being affected by the traffic message, in addition to the directly affected road segment. The processing unit subsequently treats these road segments as being affected so that the influence of the traffic event in the navigation system is larger than the directly affected road segment.

Figure 2 shows a region in which the road segments are defined to be affected by the traffic event. A received traffic message contains a reported traffic event at location 202. The road segment 204 on which location 202 resides is directly affected by the traffic event. In this embodiment, the defining unit 110 defines a circular region 206 with location 202 as its centre and defines the road segments inside this region as being additionally affected. For example road segments 208, 210 and 212 are defined to be affected by the traffic event. So in this embodiment, the influence of the reported traffic event is not only on the single road segment on which the reported location resides but also on the road segments in a circular region around this location.

Figure 3 shows an alternative region in which the road segments are defined to be affected by the traffic event. In this example, the traffic event is a traffic queue 302 with a begin or head location 304 and an end or tail location 306. The defining unit defines a region 308 with a boundary that is at a constant, predetermined distance from the road segments on which the traffic resides. The road segments inside this region are defined to be affected by the traffic queue, e.g. road segments 310, 312 and 314. The location 304 reported in the traffic message corresponds to road segment 316 and the traffic queue resides on that road segments and on road segments 318 and 320.

In an embodiment of the navigation system, the defining unit determines the type of the traffic event and classifies it accordingly. The defining unit determines whether the traffic event is structural or occasional, based on the time the traffic event occurs and on historic data. A traffic event occurring during morning or evening rush hours, e.g. between 7:00 and 9:00 and between 16:00 and 18:00, is considered a structural event. Also an event occurring regularly at the same location, e.g. on the previous two consecutive working days, is considered a structural event. A traffic event occurring at another time and not occurring regularly is considered an occasion traffic event. In case of a structural traffic event the defining unit defines the region of affected road segments to extent for 5 kilometres from the traffic event itself. So then the radius

of the circle of Figure 2 and the distance as described in Figure 3 is 5 kilometres. In case of an occasional traffic event, the extent of the region is defined to be 0.5 kilometres instead of 5 kilometres.

It is not necessary to maintain a history of event in order to be able to use a classification of the traffic event. In a somewhat simpler embodiment, a received traffic event is considered as structural if it occurs during rush hours and otherwise it is considered an occasional event. This avoids the need to maintain historic data of traffic events in the system.

Figure 4 schematically shows an embodiment of the navigation system including a planning unit. This embodiment is used in a vehicle for guiding the driver along a planned route. The navigation system 400 has a reader 402 for reading the data carrier 404 holding the database with the road segments. The data carrier 404 is a CD-ROM but another kind of storage would also be suitable, e.g. magnetic hard disk, floppy disk, SMART card and tape. The navigation system further has a receiver 108, for the reception of the traffic messages concerning road segments in the database, and a defining unit 110, for defining additional road segments being affected by the traffic event in the received traffic message. The navigation system has a planning unit 406 for planning a route between an origin and a destination. The origin may be the present position of the vehicle, e.g. obtained by a localising device, and the destination may be entered by the user of the navigation through a suitable input device. The localising device and the input device are not shown in the figure. The planning unit determines on the basis of the road segments in the database a route that is optimal for a given criterion. This criterion can be minimal travel distance or minimal travel time and can be chosen by the user for the route to be planned. A road segment has an attribute indicating the length of the represented part of the road and an attribute indicating the expected driving speed on that road. In case of a traffic event, like a traffic queue or even a full blockage of the road, these attributes will no longer reflect the actual situation and the planning unit will use the traffic message to update the attributes before using them. For instance in case of a traffic queue, the planning unit will determine the expected delay and the consequence thereof for the driving speed on that road. The planning unit will use the updated attributes to determine an optimal route. Also the relevant attributes of the additionally affected road segments, as defined by the defining unit 110, will be updated prior to being used by the planning unit 406. The

planned route is stored in memory space 408 and a guidance unit 410 provides guidance information to the driver for following the planned route. The guidance information is presented on a display 412 and via a speaker 414.

The level of affection by the traffic event is not the same for all road segments and may be adapted to the circumstances, e.g. in dependence on the density of the road network at the place of the road segment. In a certain embodiment, the level of affection of a road segment is made dependent on the distance between the road segment and the location of the traffic event. First the influence of the traffic event is determined on the basis of the received traffic message. For instance a traffic queue of a given length is translated to an expected average speed on the corresponding road segment. This speed will be a certain factor slower than the undisturbed speed as stored in the database. Then this factor will be applied to the speed on the additionally affected road segments in proportion to their distance to the traffic event, whereby the speed on a road segment further away than a certain maximum distance will not be adapted. This is realised in the following way. For the road segment on which the traffic event takes place:

$$F = V_{dis} / V_{norm} \qquad (1)$$

in which: V_{norm} is the normal speed on the road segment,
V_{dis} is the disturbed speed on the road segment due to the traffic event,
F is the speed reduction factor, F is smaller than 1.

For the additionally affected road segment with a distance smaller than the maximum distance of influence:

$$V_{dis} = ((d + (D - d) \cdot F) / D) \cdot V_{norm} \qquad (2)$$

in which: V_{norm} is the normal speed on the present road segment,
D is the maximum distance of influence by the traffic event,
F is the speed reduction on the road segment of the traffic event, as in eq. (1),
d is the distance between the present road segment and the traffic event,

V_{dis} is the disturbed speed on the present road segment.

It is to be understood that the invention can be applied with other functions for the calculation of the level of affection than the one given in equation (2), e.g. functions with a non-linear relation between the normal speed and the disturbed speed.

In another embodiment of the navigation system, the influence of the traffic event is taken into account by suppressing some of the road segments in the region of influence. Each road segment in this embodiment has a so-called road class attribute indicating the importance of the road represented by that road segment. The road class attribute has one of the following values:

0 motor way
1 main road
2 primary connector
3 local connector
4 local distributor
5 estate road
6 restricted road

When a traffic message is received, the road class of the road segment of the location of the traffic event is determined. The road class value of this road segment is used as a reference value in suppressing road segments later on. Then the defining unit 110 defines a region with additionally affected road segments. Now in this embodiment the route planner, when planning a route, suppresses those additionally affected road segments that have a road class value higher than the reference value. So the roads that are less important than the road on which the traffic event takes place are not regarded as candidates for planning a route. When for example a traffic message with a traffic queue on a certain main road is received, then the planning unit plans a route between the present position and the destination to verify whether the present route is still optimal. For this planning, the planning unit considers in the defined region of influence only main roads and motor ways and will not plan a route there on lesser important roads. Outside the region, no roads are discarded on the basis of the reported traffic event. It is to be understood that a set of values different from the one above may be

used for classification of the roads with respect to their importance.

Figure 5 schematically shows an embodiment of the navigation system including a display unit. The navigation system 500 has a reader 402 for reading the data carrier 404 holding the database with the road segments. The database may reside on a removable carrier, like the exemplary CD-ROM, or may reside on a fixed storage device in the navigation system. The navigation system further has a receiver 108, for the reception of the traffic messages concerning road segments in the database, and a defining unit 110, for defining additionally road segments being affected by the traffic event in the received traffic message. The navigation system has a display unit 502 for displaying the traffic message on a display 412. The display unit 502 displays the traffic event on the road segment corresponding to the reported location, in relation to the additionally affected road segments. A simple realisation of this is the presentation of a textual message including the event and the directly affected road segment together with an indication of the influenced area with the additionally affected road segments. An advanced realisation is the presentation of a map of the road segments on which the traffic event is superimposed on the road segment corresponding to the reported location and on which the additionally affected area are displayed in a style that is different from the other road segments. This style could be a different colour than the other road segments, a dimmed presentation compared to the other road segments, or a hatching of the region including the additionally affected road segment. This embodiment of the navigation system may be implemented as a system in the vehicle displaying the information to the driver or it may be implemented as a system external to a vehicle with a display positioned at the side of a road displaying the information to the drivers of all vehicles passing by.

Figure 6 shows an example of a displayed map with a region of influence. The map shows a traffic event 202 and a directly affected road segment 204. Furthermore, the region of influence 206 is shown in a hatched way, indicating that the road segments inside the region are also affected by the traffic event. In addition to the traffic event and the affected roads, the display unit may display, if this information is available, the actual position of the vehicle and the route driven. In the same way, the system may display the planned route to the destination. The display unit may display the additionally affected road segments in correspondence with the level of affection as described above. This can be realised by displaying the affected road segments in a

certain colour and with a respective brightness that is dependent on the level of affection.

The navigation system with a display unit can optionally use the suppressing of additionally road segments as described above. The display unit then displays the region of influence with only those additionally affected road segments that have value for the road class attribute equal to or smaller than the reference value. So road segments in the region of influence with a value of the road class attribute indicating a less important road are not displayed.

Figure 7 shows the steps of the method according to the invention. Step 702 is an initialisation step including for instance the display of a map with road segments, if the method is applied for display purposes, or the planning of a route, if the method is applied in a system with route planning. In step 704 is verified whether a traffic message can be received, such traffic message including a traffic event and a location where the traffic event takes place. If there is presently no traffic message, a number of steps not further detailed in here may be executed after which step 704 is again executed. If a traffic message has been received then in step 706 the road segment corresponding to the location in the traffic message is determined. this road segment is directly affected by the traffic event in the traffic message. Subsequently in step 708 a number of road segments is defined as being affected by the traffic event in addition to the directly affected road segment. Finally, in step 710 the traffic message is processed in relation to the direct related traffic event and the additionally affected road segments. After that, a return is made to step 704 for verifying whether a next traffic message is to be received and the steps are the repeated for this next traffic message. The method may be applied for displaying a map with road segments for which a traffic message may be received. For that application, step 710 displays the affected road segments, both the directly affected and the additionally affected, in a distinct way from the other road segments, so as to show the region of influence of the traffic event. The method may also be applied for planning a route between an origin and a destination over road segments for which a traffic message may be received. For that application, step 710 plans such a route while taking into account the traffic event for the affected road segments. This can be done by updating the planning related attributes of the relevant road segments.

CLAIMS:

1. A navigation system for providing navigational information to a driver, the system comprising:

- a database with road segments, a road segment representing a part of a road;
- a receiver for the reception of a traffic message indicating a traffic event and a location to which the traffic event relates, the location corresponding to at least one particular road segment which is affected by the traffic event;
- processing means coupled to the receiver for processing the traffic message in relation to the affected road segment;

characterised in

- that the system comprises defining means for defining at least one further one of the road segments as additionally affected by the traffic event and
- that the processing means are arranged for processing the traffic message in relation to the additionally affected road segments.

2. A navigation system as claimed in Claim 1, wherein the defining means are arranged to define a region around the location to which the traffic event relates and to define the road segments inside the region as additionally affected by the traffic event.

3. A navigation system as claimed in Claim 2, wherein the region has a boundary which is at a fixed distance from the particular road segment corresponding to the location to which the traffic message relates.

4. A navigation system as claimed in Claim 2, wherein the defining means are arranged to determine an event class of the traffic event of the received traffic message and to give the region a size which is based on the event class.

5. A navigation system as claimed in Claim 1, wherein the defining means are arranged to assign a respective level of affection to the additionally affected road segments and wherein the processing means are arranged to employ the level of affection of the additionally affected road segments.

6. A navigation system as claimed in Claim 5, wherein the level of affection

of at least one of the additionally affected road segments is assigned on the basis of the distance between that road segment and the location to which the traffic message relates.

7. A navigation system as claimed in Claim 2, wherein the road segments of the database have respective road class attributes indicating the importance of the respective parts of the road represented by the respective road segments and wherein the processing means are arranged to suppress, on the basis of their road class attribute, processing of the additionally affected road segments in the region which are less important than the particular road segment corresponding to the location of the traffic message.

8. A navigation system as claimed in Claim 1, wherein the processing means include a planning unit for planning a route between an origin and a destination on the basis of the road segments in the database taking into account the particular road segment affected by the traffic event and the additionally affected road segments.

9. A navigation system as claimed in Claim 1, wherein the processing means include a display unit for displaying the traffic event in relation to the particular road segment and the additionally affected road segments.

10. A method for presenting navigational information to a driver the method comprising the steps of:

- receiving a traffic message indicating a traffic event and a location to which the traffic event relates, the location corresponding to a first road segment which is affected by the traffic event;
- processing the traffic message in relation to the affected road segment;

characterised in

- that the method further comprises a step defining at least one second road segment as additionally affected by the traffic event and
- that the traffic message is processed in relation to the second road segment.

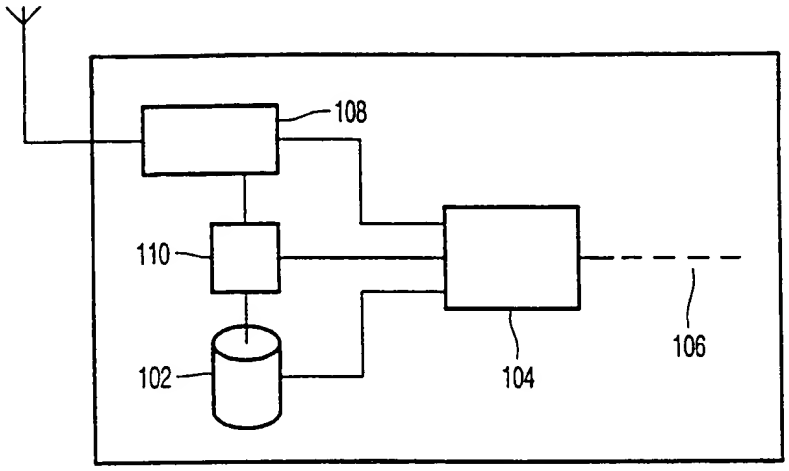

FIG. 1

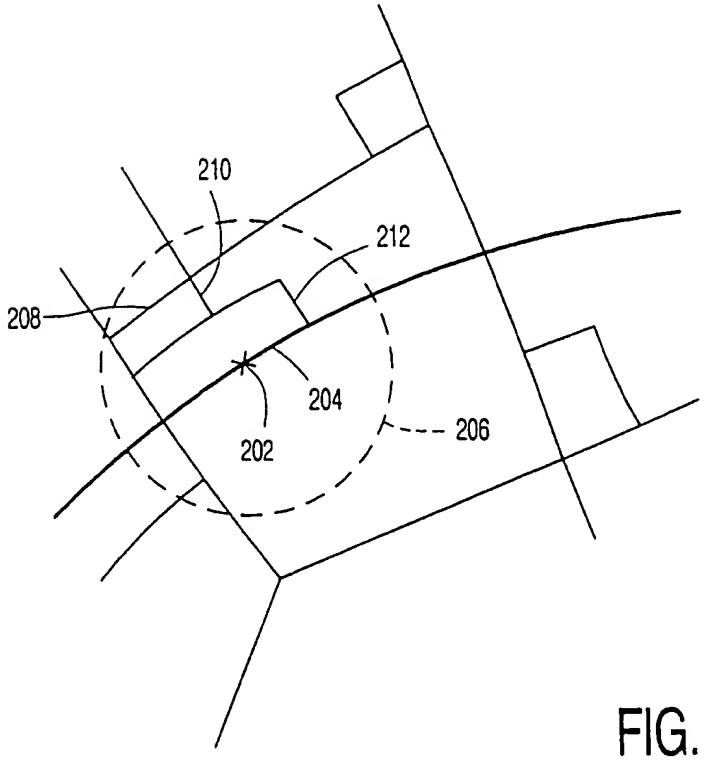

FIG. 2

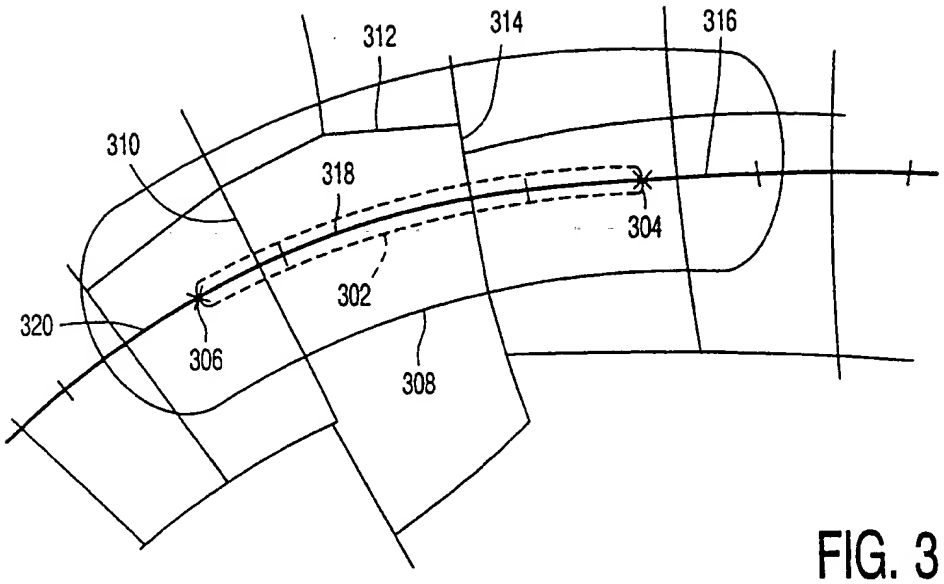
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FIG. 3

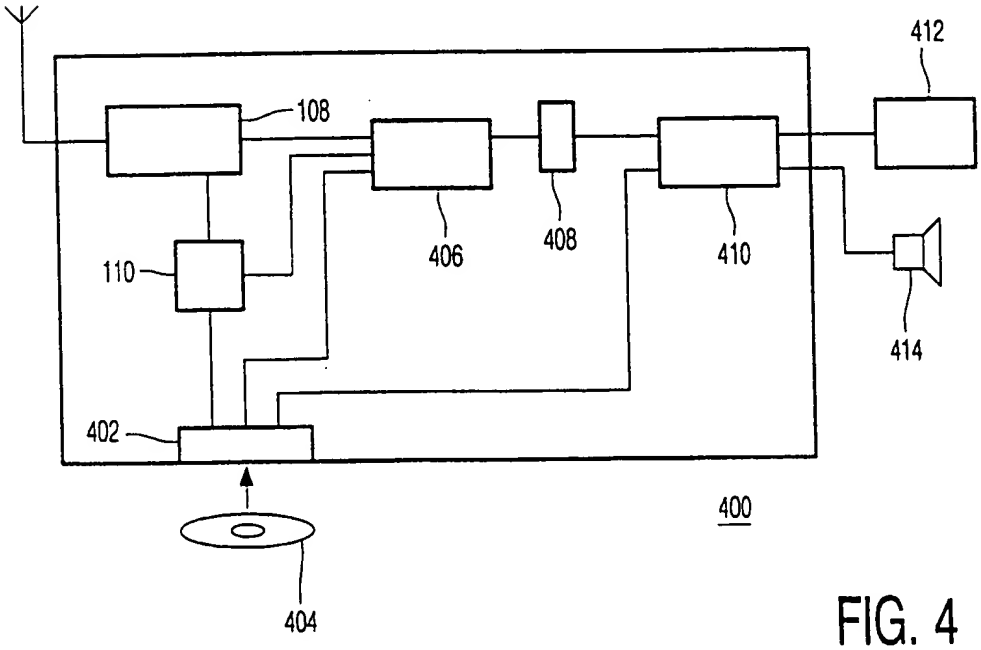
412
108
406
408
410
110
414
402
400
404

FIG. 4

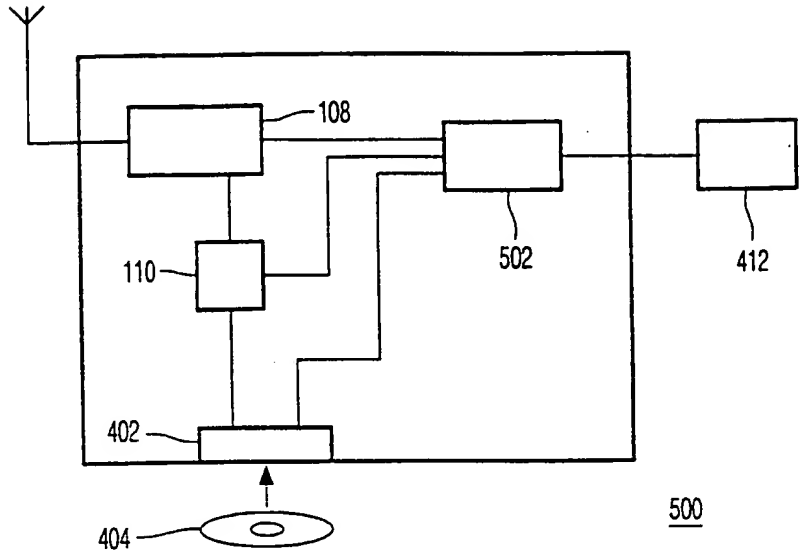

FIG. 5

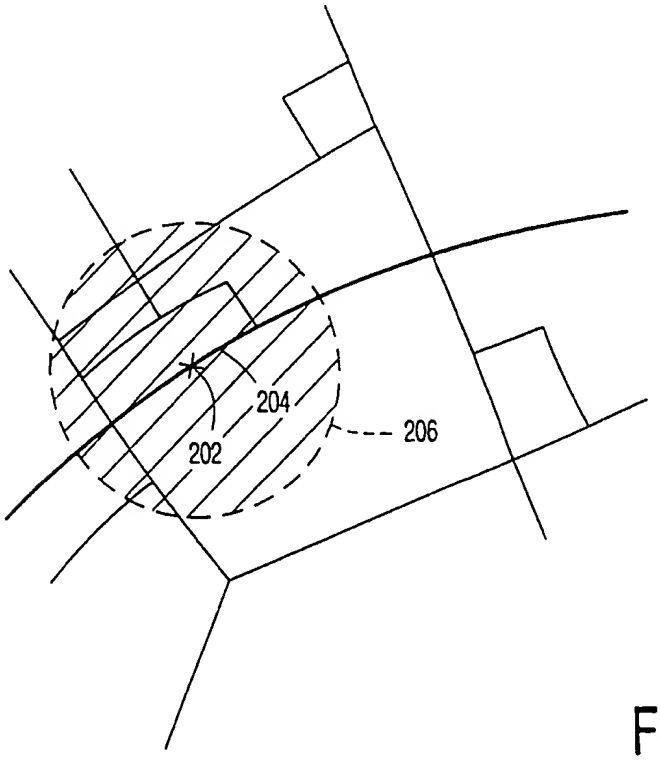

FIG. 6

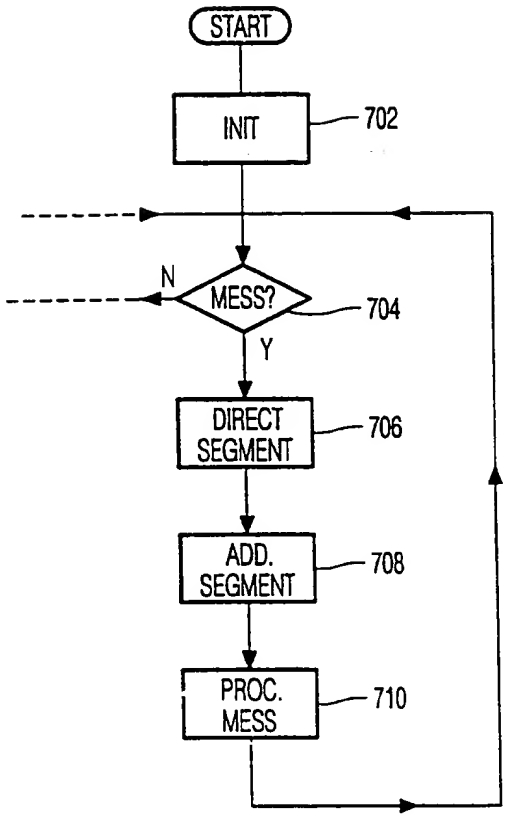
START
INIT
702
N
MESS?
704
Y
DIRECT SEGMENT
706
ADD. SEGMENT
708
PROC. MESS
710

FIG. 7

INTERNATIONAL SEARCH REPORT

Intr tional Application No
PCT/EP 99/01654

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G08G1/0968 G08G1/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 907 159 A (VERRON SERGE ET AL) 6 March 1990 (1990-03-06) column 4, line 7 - line 28	1-10
A	US 5 465 088 A (BRAEGAS PETER) 7 November 1995 (1995-11-07) figures 1A-1B	1-10
A	US 5 095 532 A (MARDUS CLAUS) 10 March 1992 (1992-03-10) cited in the application	
A	US 5 164 904 A (SUMNER ROY L) 17 November 1992 (1992-11-17) cited in the application	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 August 1999	26/08/1999

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte tional Application No
PCI/EP 99/01654

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4907159 A	06-03-1990	EP 0290679 A	17-11-1988
		AT 158886 T	15-10-1997
		AU 614745 B	12-09-1991
		AU 1584088 A	10-11-1988
		CA 1323426 A	19-10-1993
		DE 3752122 D	06-11-1997
		DE 3752122 T	02-04-1998
		JP 2720975 B	04-03-1998
		JP 63294022 A	30-11-1988
US 5465088 A	07-11-1995	DE 4208277 A	16-09-1993
		WO 9318495 A	16-09-1993
		DE 59308734 D	13-08-1998
		EP 0584310 A	02-03-1994
		JP 6507747 T	01-09-1994
US 5095532 A	10-03-1992	NONE	
US 5164904 A	17-11-1992	NONE	